passing rapidly through alcohol and oil of cloves, well drying with pressure of blotting-paper folded four times, and mounting in Canada balsam. In its

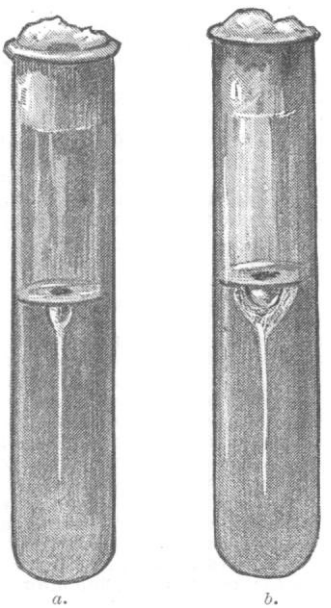

FIG. 2. — CULTURE OF KOCH'S COMMA BACILLUS OF CHOLERA IN NUTRIENT GELATINE.

a, second day; *b*, fourth day.

biological characteristics, Koch's bacillus differs from that of Finkler and Prior, as will be seen from the following table : —

Koch's bacillus.	*Finkler's bacillus.*
Plate-culture. — Colonies faintly golden red; irregular, indented margins.	*Plate-culture.* — Colonies liquefy gelatine much more rapidly; faint, brownish-yellow tinge; larger and rounder margin, well defined.
Tube-culture. — Fig. 2, puncture in nutrient gelatine. Liquefaction commences slowly at upper part of needle-tract; forms a funnel-shaped excavation enclosing a bubble of air; lower part of needle-tract resembles a white thread, and remains so for several days.	*Tube-culture.* — Fig. 3, puncture in nutrient gelatine. Liquefaction more rapid; extends along whole length of needle-tract, and forms a conical, misty culture, gradually resembling the finger of a glove turned inside out.
Surface-culture. — (Agar-agar). Forms semi-transparent, white plaque; liquid at bottom of oblique surface; becomes milky.	*Surface-culture.* — (Agar-agar). The same forms much more quickly; and in addition, after a certain time, a characteristic coffee-colored stratum appears at the bottom of the liquid.
Potato-culture. — Only grows at temperature of the blood (37° C.), forming a transparent, slightly brownish layer.	*Potato-culture.* — Grows at ordinary temperature; culture brown, with whitish margin. Surface of potato appears corroded.

Babes and Crookshank have examined over one hundred pure cultures of Koch's bacilli of various ages and on various media. The round bodies frequently found, either alone, or accompanying filamentous and irregular spirilliform developments of the comma bacilli, were found in all cases to be perfectly sterile. At the recent meeting at Munich, von Pettenkofer and Emmerich bitterly opposed Koch's conclusions, and asserted that his bacillus had never been found in the mucous membrane of the intestine. The drawing here given, taken from a section of intestine of a patient who died of Asiatic cholera, and prepared by Babes and Crookshank, — a preparation which I have seen many times, — is rather damaging to the Munich school.

I have several cultivations of the Finkler. Prior, and Koch bacilli under observation, and the biological and morphological characteristics of each are distinct and sharply defined.

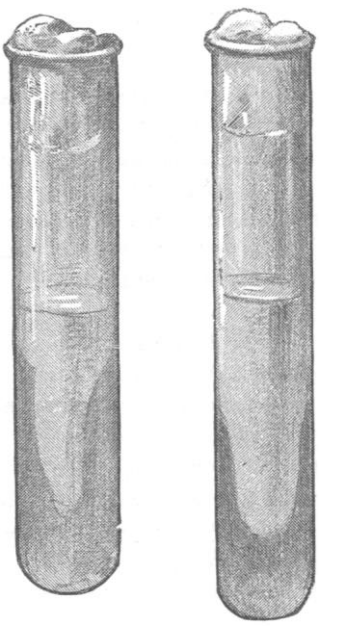

FIG. 3. — CULTURE OF FINKLER AND PRIOR'S COMMA BACILLUS OF CHOLERA NOSTRAS IN NUTRIENT GELATINE.

a, second day; *b*, fourth day.

Raptchievski (Wratch., 1885, No. 7) reports an interesting case from St. Petersburg. A microscopic examination of the dejections showed, 1°, long and narrow bacteria, as found by Bienstock (*Zeitschr. klin. med.*, vol. viii.) in normal fecal matter, such as produce putrefaction in albuminous matter; 2°, chains of oval micrococci, similar to the microbes found by the French commission (*Archives de physiol.*, 1884, No. 4, pl. 11, fig. 6); 3°, a bacillus exactly similar to that described by Koch; 4°, another in greater quantity, found by Finkler and Prior in cholera nostras. HORATIO R. BIGELOW, M.D.

Berlin, Germany, May 5.

The reddish-brown ring around the sun.

The ring of reddish-brown color surrounding the sun, and enclosing a disk of glowing whitish light, to which Prof. G. H. Stone called attention in *Science* for May 22, p. 415, has been most carefully studied by Kiessling of Hamburg, who has shown clearly that it is due to diffraction on minute particles suspended in the air. Careful observers agree that it was not seen before November, 1883; but since then

it has attracted much attention. It is manifestly produced in the upper regions of the atmosphere; for it is best seen from elevated mountains, where it is continually visible in clear weather. It is often hidden at low stations by the plentiful reflected skylight that comes from the coarser dust of the lower atmosphere, even though the sky seem tolerably clear. It has been astonishingly distinct here in Cambridge through the past winter, on the clear anti-cyclonic days, with north-west winds, following the withdrawal of the cyclonic cloud-disk; and it attains its greatest visibility between clouds, because much of the lower dusty air is then in shadow, and does not outshine the delicate colors of the ring. On some recent cloudless but slightly hazy days it has been entirely invisible.

I have not observed the connection between the visibility of the ring and the changes of temperature and formation of clouds noted by Professor Stone, and should be glad to learn more details as to date of observations, and as to closeness of the connection in point of time. A comparison of observations on these questions made at Colorado Springs (where I presume Professor Stone made his records) and on the summit of Pike's Peak would be very instructive in this respect.

The most remarkable point in connection with the ring is its persistence long after the cessation of the brilliant twilights with which it began. How is the volcanic dust or the ice dust that causes it supported so long? It seems incredible that dust could simply float for a year and a half in so thin a medium as the atmosphere at a height of ten or more miles. Electrical repulsion has been suggested as a supporting force, and it may be somewhat effective above the level of storm-circulation; but, besides this, it seems possible that the peculiar properties of water-vapor may give some aid. Wollaston long ago speculated on the limitation of the atmosphere at an altitude where its gases were frozen. The solid particles would there fall till evaporated, when the gases thus formed would rise again till frozen once more by the cold of expansion. Ritter and others have recently reconsidered this process. Whether the theory is applicable or not to oxygen and nitrogen, it certainly is of importance when water-vapor is considered: for, as is well known, the elasticity and condensibility of this constituent of the atmosphere are mutually antagonistic. The vapor tends to diffuse itself to altitudes where the cold caused by its expansion would require the condensation of a part of it; and, although such perfect diffusion is prevented in the lower atmosphere by the friction that the vapor suffers in passing through the air, it does not seem unreasonable to believe it may obtain at great altitudes where a normal distribution of vapor must be more nearly attained, and especially so at times when an extra supply of both vapor and dust is shot high out of volcanic craters. We may therefore believe that at some high level the atmosphere is 'saturated' with vapor: above this there will be continual condensation, supplying a delicate shower of the minutest ice particles; and, if these really need a solid nucleus to freeze upon, the nuclei may be sustained by the continuous upward diffusion of the vapor that rises to take the place of that which has been condensed, only to be condensed itself in its turn. Kiessling's discussion of the diffractive action of particles suspended at considerable altitudes fully accounts for the twilights and the solar ring; and the close agreement in date of occurrence of several great volcanic explosions, and subsequent brilliant twilight displays, naturally leads to the acceptance of the volcano as the source of the diffracting matter. Perhaps the Wollastonian idea may aid in explaining the remaining difficulty; namely, the long-continued suspension of some of the diffracting matter in the upper atmosphere.

W. M. DAVIS.

Cambridge, May 24.

Life.

In the brief abstract in *Science* (May 8, p. 386) of my address on 'Life,' at the celebration of the semi-centennial anniversary of the Lyceum of natural history of Williams college, I am credited with the following statement: "Kick a stone and a dog: the difference in the result *is caused* by education."

The words are printed in quotation-marks, as if they were my own; and, as a friend tells me that they seem to him to imply a belief that life has been produced by the education of dead matter, and that a stone might be educated into a dog, I hope you will give me space to say that the words are not mine.

Beyond the quotation, with approval, of Huxley's statement, — that "for us, at least, the distinction between living bodies, and those which do not live, is an ultimate fact," — the address contained no opinions regarding the origin or cause of life. It was devoted to the presentation of a definition; and I tried to show, first, that education makes us acquainted with the order of nature, and thus enables us to use one event as the sign of another which is to follow, and to regulate our actions according to the laws of nature; and secondly, that, since all living things respond to the order of nature in the same way, they also are educated; and that education, or the ability to make such responses, is life.

The writer of the abstract in *Science* had no opportunity to consult my manuscript, but I believe that the sentence which I have quoted is from his notes on a passage which reads as follows: "The actions of the dog are significant. They stand in relation to the external world, and their *meaning* could never be learned from the study of the dog's body, but must be sought in his environment, and that of his ancestors. The real difference between living and dead matter lies in this *significance* of the actions of living things. This is what we really mean when we say that the dog is alive, while the stone is not."

W. K. BROOKS.

EBENEZER EMMONS.

PROFESSOR EBENEZER EMMONS was born at Middlefield, Mass., May 16, 1800,[1] and died at his plantation, Brunswick county, N.C., on the 1st of October, 1863.

He was prepared for college at Plainfield, Mass., under the Rev. Mr. Halleck, entered Williams college at the age of sixteen, and was graduated in the class of 1820.

As a surgeon, Dr. Emmons ranked high in his profession, and for fifteen years was the most eminent practitioner in Berkshire county. He was appointed professor of chemistry at

[1] His birth has been variously stated as in 1798 and 1799; but he always stated to his children that he was born in 1800.